Course Notes
Class 9th

PHYSICS

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Chapter No # 01
Physical Quantities and Measurement

1. Abbreviations of Science and Physics.

Ans.

SCIENCE		
S	Systematic and	Science
C	Comprehensive	Club
I	Investigation and	Is
E	Exploration of	Essential
N	Nature's	Necessary for
C	Causes and	Continues
E	Effects	Evolution

PHYSICS		
P	Positive	Practical
H	Humble	Hypothetical
Y	Yonder	Yielding of
S	Studious	Scientific
I	Inexperienced	Intellectual
C	Communicative	Conceptual
S	Scientific	Skills

2. What is Science and Physics?

Lhr.2014, 15

Ans. The knowledge gained through observations and experimentations are called **science**. The word science is derived from the Latin word "**Scientia**" which means knowledge.

"The branch of science which deals with the study of matter, energy and their interaction." The law and principles of Physics help us to understand the nature.

3. What are natural philosophy and its types?

Lhr.2019

Ans. Not until eighteen century, various aspect of material objects were studied under a single subject called natural philosophy. There are two types:

(i) Physical science which deals with the study of non-living things.

(ii) Biological science which deals with the study of living things.

4. Define Mechanics and Heat.

Ans. The branch of Physics which deals with the study of motion of object, its causes and effects.

It deals with the nature of heat, modes of transfer and effects of heat.

5. Define Sound and Light.

Ans. It deals with the physical aspects of sound waves, their production, properties and applications.

It is the study of physical aspects of light, properties, working and use of optical instruments.

6. Define Electricity and Magnetism.

Ans. It is the study of charges at rest and in motion, their effects and their relationship with magnetism.

7. Define Atomic Physics.

Lhr.2017

Ans. The branch of Physics which deals with the study of the structure and properties of atoms.

8. Define Nuclear Physics.

Lhr.2016, 17

Ans. The branch of Physics which deals with the study of properties and behavior of nuclei and the particles within the nuclei is called nuclear physics.

9. Define Plasma Physics.

Lhr.2013, 16, 18

Ans. The branch of Physics which deals with the study of production, properties of the ionic state of matter—the fourth state of matter.

10. What is Geo-Physics?

Lhr.2013, 18

Ans. The branch of Physics which deals with the study of internal structure of the earth.

11. Define physical quantity? Lhr.2019

Ans. All measurable quantities are called physical quantities such as length, mass, time and temperature.

Physical quantities are divided into base and derived quantities.

12. What is base quantity?

Lhr.2016, 17, 18, 19

Ans. Base quantities are the quantities on the basis of which other quantities are expressed.

These are length, mass, time, electric current, temperature and intensity of light.

13. What is derived quantity?

Lhr.2013, 15, 16, 17

Ans. The quantities that are expressed in terms of base quantities are called derived quantities.

These are area, volume, speed, force, work, energy, power, electric charges and electric potential etc.

14. Define system international unit (SI Units).

Lhr.2013, 16

Ans. The Eleventh General Conference on weight and measures held in Paris in 1960 adopted a worldwide system of measurements called international system of units.

The units of seven base quantities are metre, kilograms, second, ampere, Kelvin, candela and mole.

15. What are base units and derived units?
Lhr.2013, 19

Ans. The units that describe base quantities are called base units. e.g length(l), mass(m), time(t) etc.

The units used to measure derived quantities are called derived units. e.g speed, force, work etc.

16. What are Prefixes with example?
Lhr.2016, 18, 19

Ans. The words or letters added before SI unit and stand for the multiples or sub-multiples of that unit is known as prefixes. i.e. kilo, mega, milli, micro, etc.

17. What is Scientific Notation?
Lhr.2016, 18, 19

Ans. A number is expressed as some power of 10 multiplied by a number between 1 and 10 is called scientific notation or standard form.

e.g $365000 = 3.65 \times 10^5$.

18. What is meter rule and measuring tape?

Ans. A **meter rule** is a length measuring instruments. It is commonly used in daily life to measure length of an object or distance between two points. It is one metre long and has 100 centimetres.

Measuring tapes are used to measure length in metres and cetimetres. A measuring tape used by blacksmith carpenters. A measuring tape consists of a thin and long strip of cotton, metal or plastic 10m, 20m, 50m, or 100m long. Measuring tapes are marked in centimeter as well as inches.

19. Write two names of measuring instruments.
Lhr.2017

Ans. The names of two measuring instruments are

(i) The meter rule

(ii) The measuring tape

20. What is vernier caliper?

Ans. An instrument used to measure small lengths such as internal or external diameter or length of a cylinder is called as vernier calipers.

The accuracy obtained in measurement using a metre rule is upto 1mm.

21. What is least count of vernier calipers?
Lhr.2014, 15, 16, 17

Ans. The difference between the one small division on main scale and one vernier scale division is 0.1mm. It is called least count of vernier calipers.

$$\text{L.C of vernier calliper} = \frac{\text{small reading on main scale}}{\text{no.of division on vernier scale}} = \frac{1mm}{10\ divisions} = 0.1\ mm$$

L.C of V.C = 0.1mm= 0.01cm.

22. What is meant by zero error?
Lhr.2014

Ans. Zero error will exist if zero of the vernier scale is not coinciding with the zero of main scale.

Positive Zero Error. If zero line of vernier scale is on the right side of zero of the main scale.

Negative Zero Error. If zero line of vernier scale is on the left side of zero of the main scale.

23. What is meant by zero correction?
Lhr.2014

Ans. Zero correction.

(i) To correct the positive zero error subtracts the value of error from final answer.

(ii) To correct the negative zero error adds the value of error from final answer.

24. Define screw gauge.

Ans. A screw gauge is an instrument that is used to measure small lengths with accuracy greater than Vernier Caliper. It is also called as micrometer screw gauge.

25. Describe Pitch of screw gauge.

Ans. The thimble completes one rotation, hundred division spindle moves 1mm distance. This distance is called the pitch of screw gauge.

$$\text{Least Count} = \frac{\text{pitch of the screw gauge}}{\text{no. of division on circular scale}} = \frac{1mm}{100\ divisions} = 0.01\ mm$$

L.C = 0.01mm or 0.001cm

26. What is zero error of Screw Gauge?

Ans. Zero error will exist if zero of the circular scale cross or below the index line.

Positive Zero Error. If zero of the circular scale is behind the index line.

Negative Zero Error. If zero of the circular scale has cross the index line.

27. What is meant by Stopwatch?

Ans. *A stopwatch is used to measure the time interval of an event.*

There are two types of stopwatch; mechanical and digital stopwatch.

(i) A **mechanical stopwatch** can measure the time interval up to a minimum 0.1 second.

(ii) A **digital stopwatch** can measure the time interval as small as 1/100 seconds or 0.01 sec.

28. What is measuring cylinder?

Ans. A measuring cylinder is made of a glass or transparent plastic material. It has a scale that indicated the volume in milimetre (*ml*). It has different capacities from 50 *ml* to 1000 *ml*. They are used to measure the volume of a liquid or powered substance. It is also used to find the volume of an irregular shaped solid insoluble in a liquid by displacement method.

29. What is meant by significant figures of a measurement?

Ans. All the accurately known digits and the first doubtful digits in an expression are called significant figures. It reflects the precision of a measured value of a physical quantity.

30. Write two rules to find the significant digits in a measurement. Lhr.2016

Ans. Following are two rules to find the significant digits in a measurement:

(i) Non-zero digits are always significant.

(ii) Zeros between two significant figures are also significant.

31. On what factor depends physical quantity in significant figures?

Ans. The accuracy of measured physical quantity depends upon

(i) The quality of measuring instrument.

(ii) The skill of the observer.

(iii) The number of observation.

32. Estimate your age in seconds.

Lhr.2014, 15, 16, 17, 18

Ans. Suppose the age of students is 15 year

Age = 15 year

= year × day × hour × mint × sec

= 15 × 365 × 24 × 60 × 60

= 473,040,000 seconds.

= 4.73×10^8 seconds.

33. What rule SI units have played in the development of science?

Ans. With the developments in the field of science and technology, the need for a commonly acceptable system of units was seriously felt all over the world particularly to exchange scientific and technical information.

34. What do you understand by the zero error of a measuring instrument?

Ans. In measuring instruments there may be systematic error, due to which a measurement may be less or greater than actual measurement.

35. Why use of zero error is necessary in measuring instruments? Lhr.2013

Ans. The use of zero error in measuring makes the measurement taken by it precise. The use of zero error is a measurement which is known as zero correction.

36. Why do we need to measure extremely small interval of time?

Ans. We need to measure extremely small interval of times for obtaining greater accuracy in the result.

37. How is precision related to the significant figures in measured quantity?

Ans. Precision means how close the measured values to each other. More significant figure means greater precision. Thus, a measured quantity having more significant figures will be more precise.

38. Which telescope orbits around the earth?

Ans. Hubble Space telescope orbits around the Earth. It provides information about stars.

39. Describe Andromeda Galaxy.

Ans. Andromeda is one of the billions of galaxies of known universe.

40. Your hairs grow at the rate of 1mm per day. Find their growth rate in nm s^{-1}.

Lhr.2016, 18

Ans. **Rate of hairs growth** $= \frac{1mm}{day}$

$= \frac{1\times 10^{-3} m}{1 \times 24 \times 60 \times 60 \text{ sec}}$

$= \frac{1\times 10^{-3} m}{86400 \text{ sec}}$

$= 1.157 \times 10^{-5} \times 10^{-3} ms^{-1}$

$= 1.157 \times 10^{-8}$ ms^{-1}

$= 11.57 \times 10^{-1} \times 10^{-8}$ ms^{-1}

$= 11.57 \times 10^{-9}$ ms^{-1}

Rate of hair growth = 11.57 nms^{-1}

Chapter No # 02
Kinematics

41. Define kinematics.

Ans. **Kinematics** is the study of motion of an object without discussing the cause of motion.

42. Define rest and motion.

Ans. A body is said to be **rest** if it does not change its position with respect to its surroundings.

A body is said to be **motion** if it change its position with respect to its surroundings.

43. Describe absolute rest or absolute motion.

Ans. Rest and motion are always relative. There is no such thing as absolute rest or absolute motion.

44. What is translatory motion?

Lhr.2016, 18

Ans. In translational motion, a body moves along a line without any rotation. This line may be straight or curved. i.e. A cars moving in straight line, earth and sun revolve.

45. Define linear motion. Lhr.2014

Ans. If a body moves along a straight line then the motion of a body is known as linear motion. A cars moving in straight line etc.

46. What is circular motion?

Ans. The motion of an object in a circular path is known as circular motion. i.e. motion of earth around the sun and motion of moon around the earth.

47. What is random motion?

Lhr.2013, 14, 18

Ans. The irregular or disordered motion of an object is known as random motion. i.e. motion of birds, insects, dust or smoke particle, gas molecule is random motion.

48. What is rotatory motion? Lhr.2013

Ans. The spinning motion of a body about its axis is known as rotatory motion. i.e. The motion of wheel about its axis and that of a steering wheel.

49. What is vibratory motion? Lhr.2017, 19

Ans. To and fro motion of a body about its mean position is known as vibratory motion. i.e. a baby in a cradle. Motion of pendulum in clock. A baby in a cradle moving to and fro, Motion of a pendulum in a clock.

50. Define scalar with example.

Lhr.2014, 15, 17, 18, 19

Ans. A scalar quantity is described completely by its magnitude only. i.e. mass, length, time, speed volume, work and energy.

51. Define vectors with example.

Lhr.2013, 14, 15, 17, 18, 19

Ans. A vector quantity is described completely by its magnitude and direction. i.e. velocity, displacement, force, momentum, torque etc.

52. Define position and origin.

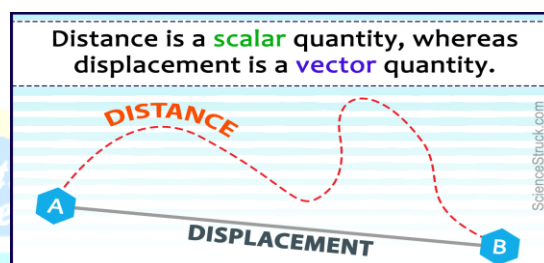
Ans. The distance and direction of a body from fixed point shows the position of a body.

The terms position described the location of a place or a point with respect to some reference point.

53. What is distance and displacement?

Lhr.2016, 17

Ans. Length of a path between two points is called the **distance** between these points.

Displacement is the shortest distance between two points which has magnitude and direction.

54. Define speed.

Lhr.2013, 14, 15, 16

Ans. *The distance covered by an object in unit time is called its speed.*

$$S = v\,t$$

The SI unit of speed is ms^{-1}.

55. Define uniform speed. Lhr.2016

Ans. A body has uniform speed if it covers equal distance in equal interval of time however short the interval may be.

56. Define velocity.

Lhr.2013, 14, 15, 16, 19

Ans. *The rate of change of displacement of a body is called velocity.*

$$V = \frac{distance}{time} = \frac{d}{t}$$

The SI unit of velocity is ms^{-1}.

57. Define uniform velocity. Lhr.2016

Ans. A body has uniform velocity if it covers equal displacement in equal interval of time however short the interval may be.

58. Describe acceleration with unit.

Lhr.2015, 16, 17, 18

Ans. *The rate of change of velocity of a body is called acceleration.*

$$a = \frac{change\ in\ velocity}{time\ taken} = \frac{Vf - Vi}{t} = \frac{\Delta v}{t}$$

The SI unit of acceleration is ms^{-2}.

59. Define uniform acceleration. Lhr.2016, 17

Ans. A body has uniform acceleration if it has equal changes in velocity in equal interval of time, however, short the interval may be.

60. What is negative and positive acceleration?

Ans. Acceleration of a body is positive if its velocity increases with time. The direction of this acceleration is the same in which the body is moving without change in its direction.

Acceleration of a body is negative if velocity of a body decreases. The direction of negative acceleration is opposite to the direction in which the body is moving. Negative acceleration is also called **deceleration** or **retardation.**

61. Write equations of motion.

Ans. There are three equations of motion.

(i) $v_f = v_i + at$

(ii) $S = v_i t + \frac{1}{2} at^2$

(iii) $2as = v_f^2 - v_i^2$

62. Define gravitational acceleration and write its value. Lhr.2016

Ans. The acceleration of freely falling bodies is called gravitational acceleration. It is denoted by g. on the surface of the earth. Its value is 10 ms^{-2}.

63. Can a body moving at a constant speed have acceleration? Lhr.2014

Ans. Yes! A body moving at a constant speed has acceleration if the direction of moving body changes, which produce acceleration, e.g. particle moving in a circle with uniform speed.

64. How do riders in a Ferris wheel possess translatory motion but not rotatory motion?

Ans. Riders moving in a Ferris wheel are also in translational motion. Their motion is in a circle without rotation.

65. How can vector quantities be represented graphically?

Ans. Graphically, a vector can b represented by a straight line with an arrow head at its one end. The length of the line AB gives the magnitude of the vector **V** on a selected scale. While the arrow head of the line from A to B gives the direction of the vector V. A ⟶ B

66. Why vector quantities cannot be added and subtracted like scalar quantities?

Ans. Vector and scalar quantities cannot be added and subtracted by same method because vector quantities are added by head to tail rule while scalars are added by algebraic method.

67. How are vector quantities important to us in our daily life? Lhr.2016

Ans. Vector quantities important to us in our daily life because with the help of vector quantities we can explain the position of an object with distance and direction.

In our daily life, the vector quantities are completely expressed or explained only when their directions are also considered.

68. What is the speed of animals?

Ans. Falcon can fly at a speed of 200kmh^{-1}. Cheetah can run at a speed of 70kmh^{-1}.

69. Describe LIDAR GUN.

Ans. A LIDAR gun is a light detection and ranging speed gun. It uses the time taken by laser pulse to make a series of measurements of a vehicle's distance from the gun. The data is then used to calculate the vehicle's speed.

70. Define velocity of paratrooper. Lhr.2019

Ans. A paratrooper attains a uniform velocity called terminal velocity with which it comes to ground.

Chapter No # 03
Dynamics

71. Define Dynamics.

Ans. The branch of mechanics that deals with the study of motion of an object and the cause of its motion is called dynamics.

72. Define force and unit of force.

Lhr.2014, 15, 16, 17

Ans. *A force moves or tends to move, stop or tends to stop the motion of the body. The force can also change the direction of motion of a body.*

A force can also change the shape or size of a body on which it acts.

Unit of Force.

The unit of force is newton (N). According to Newton's 2nd law of motion.

One newton (1N) is the force that produces an acceleration of $1ms^{-2}$ in a body of mass of 1 kg.

$$1N = 1kg\ ms^{-2}$$

73. Define law of inertia.

Lhr.2014, 15, 16

Ans. ***Inertia*** *of a body is its property due to which it resists any change in its state of rest or motion.*

Inertia of a body with its mass, greater is the mass of a body greater is its inertia.

74. Describe momentum, its formula and unit.

Lhr.2014, 15

Ans. Momentum of a body is the quantity of motion it possesses due to its mass and velocity.

The momentum P of a body is given by the product of its mass m and velocity v.

$$P = mv$$

Momentum is a vector quantity. Its SI unit is $kgms^{-1}$.

75. Define first law of motion with example.

Lhr.2016, 18

Ans. *A body continues its states of rest or of uniform motion in a straight line provide no net force acts on it.*

i.e. a book lying on a table remains at rest as long as no net force acts on it.

Since Newton's first law motion deals with the inertial property of matter. Therefore, Newton's first law of motion is also known as law of inertia.

76. Explain second law of motion.

Ans. When a net force acts on a body, it produces acceleration in the body in the direction of the net force. The magnitude of this acceleration is directly proportional to the net force acting on the body and inversely proportional to its mass.

$$F = m\,a$$

The SI units force is Newton (N).

77. Define mass and weight.

Lhr.2014, 15, 17, 18

Ans. **Mass.** *Mass of a body is the quantity of matter possessed by it.*

It is a scalar quantity and does not change with change of place.

$$m = w/g$$

The SI unit of mass is kilograms (kg).

Weight. *Weight of a body is the force of gravity on it.*

It is a vector quantity. It varies depending upon the value of **g**, acceleration due to gravity.

$$w = mg$$

The SI unit of weight is newton (N).

78. Define third law of motion with example?

Lhr.2017, 19

Ans. Newton's third law of motion states

To every action there is always an equal but opposite reaction.

Consider a book lying on a table. The weight of the book is acting on the table in the downward direction. This is the action. The reaction of the table acts on the book in the upward direction.

79. Define Action and Reaction.

Ans. The force exerted by first body on the second body is called action.

The force exerted by the second in the response on the first body is called reaction.

80. What is friction and Co-efficient Friction?

Ans. *The force that opposes the motion of moving objects is called friction.*

Friction is highly desirable when climbing up a hill. Friction is a force that comes into action as soon as a body is pushed or pull over a surface.

Limiting Friction. The maximum value of friction is known as the force of limiting friction (F_s).

$$F_s = \mu R = \mu mg$$

Co-efficient Friction. Lhr.2019

The ratio between the force of limiting friction F_S and the normal reaction R is constant. This constant is called the coefficient of friction and represented by μ.

$$F_s = \mu R = \mu mg$$

81. Define sliding and rolling frictions.

Ans. The force between the sliding objects which opposes the relative motion between them.

The force between the rolling body and the surface over which it rolls.

Rolling friction is lesser than the sliding friction.

82. What are centripetal force and centrifugal force.? Lhr.2014, 15, 16, 17, 18, 19

Ans. *Centripetal force is a force that keeps a body to move in a circle.*

$$F_c = mv^2/r$$

Centrifugal Force.

According to newton's third law of motion, there exists a reaction to the centripetal force. Centripetal reaction that pulls the body outward during the circular motion.

83. Why is it dangerous to travel on the roof of a bus?

Ans. it is dangerous to travel on the roof of a bus because when the driver applies the brakes. The passengers on the roof may fall due to inertia.

84. Why does a passenger move outward when a bus takes a turn?

Ans. When a bus takes a sharp turn, passengers fall in the outward direction. It is due to inertia that they want to continue their motion in a straight line and thus fall outwards.

85. How can you relate a force with the change of momentum of a body?

Ans. Newton's second law of motion as

When a force acts on a body, it produces an acceleration in the body and will be equal to the rate of change of momentum of the body.

$$\frac{P_f - P_i}{t} = F$$

86. Action and reaction are always equal and opposite. Then how does a body moves?

Ans. Action and reaction act on different bodies. They do not balance each other. Action is on the one body and reaction is on the other body. As action and reaction are equal in magnitude but opposite in direction, thus a body moves.

87. A horse pushes the cart. If the action and reaction are equal and opposite. Then how does a body moves?

Ans. A horse applies action force by feet on the road, this is action and the reaction is given by roads on horse, due to which horse moves. The cart which is tied with the horse also moves.

88. What is the law of conservation of momentum?

Ans. The momentum of an isolated system of two or more than two interacting bodies remains constant. total initial momentum before collisions = total initial momentum after collisions

$$m_1 u_1 + m_1 u_1 = m_2 v_2 + m_2 v_2$$

89. Why is the law of conservation of momentum important?

Ans. By using law of conservation of momentum it is possible to calculate force, velocity and acceleration of a body. It is applicable universally not only for the small bodies like electrons and protons but for large bodies like planets and stars.

90. When a gun is fired, it recoils. Why? Lhr.2016, 18

Ans. Consider a system of gun and a bullet. Before firing the gun, both the gun and bullet are at rest. So the total momentum of the system is zero. As the gun is fired, bullet shoots out of the gun and acquires momentum. To conserve momentum of the system, the gun recoils.

91. Describe two situations in which force of friction is needed.

Ans. Friction plays very important role in our daily lives.

(i) Friction is required by birds to fly in the sky.

(ii) Friction is needed to walk on the ground. We cannot run on slippery ground.

(iii) Friction is needed to hold a pen and to write a word on your notebook.

92. How does oiling the moving parts of a machine lower friction?

Ans. Because liquid friction is less than solids. No surface is completely smooth. By oiling the surface, the pits and bumps are filled with oil and so friction is reduced. Also surface becomes slippery due to oiling.

93. Describe ways to reduced frictions? Lhr.2013, 14, 19

Ans. The friction can be reduced by following methods.

(i) Making the sliding surface smooth.

(ii) Making the fast moving objects a streamline shape as cars, aero planes.

(iii) Lubricating the sliding surface is oily or grease.

(iv) Using the ball bearings or roller bearings.

94. Why rolling friction is less than sliding friction? Lhr.2013, 14, 18

Ans. The rolling friction is less than sliding friction because

(i) The contact between wheel and surface in only at one point.

(ii) There is no relative motion between wheel and surface.

95. What do you know about braking force?

Ans. The braking is a force between brakes bushes and wheels of vehicles. It helps to stop wheels.

96. What do you know about seatbelts and the skidding of vehicles?

Ans. **Seat Belts:** A seat belt, also known as a safety belt, is a vehicle safety device designed to secure the occupant of a vehicle against harmful movement that may result during a collision or sudden stop.

Skidding of Vehicles:

When a vehicle stops quickly, a large force of friction is needed. But there is a limit to this force of friction that tyre can provide. If the brakes are applied too strongly, the wheels of the car will lock up (rupturing) and vehicle slide over the road. It is called skidding of vehicles.

97. What would happen if all friction suddenly disappears?

Ans. If all friction suddenly disappear then bodies can't be moved and can't be turned and even not change its state.

98. Why the spinner of the washing machine is made to spin at a very high speed?

Ans. The spinner of the washing machine is made to spin at a very high speed to provide required centrifugal force, due to which undesired particle can be easily removed from the clothes.

99. Describe Atwood Machine.

Ans. An Atwood machine is an arrangement of two objects of unequal masses. Both the objects are attached to the ends of a string. The string passes over a frictionless pulley. This arrangement is sometime used to find the acceleration due to gravity.

100. Write any some advantages and of friction.

Ans. **Advantages of Friction:**

(i) It cannot be written if there would be no friction between paper and pencil.

(ii) Friction enables us to walk on ground. We cannot run on a slippery ground because it offers very little friction.

(iii) Birds could not fly, if these are no air resistance. The reaction of pushed air enables the birds to fly.

(iv) Friction is highly desirable when climbing up a hill.

Disadvantages of friction:

(i) Friction is undesirable when moving with high speeds because opposes the motion and thus limits the speed of moving objects.

(ii) Most of our useful energy is lost as heat and sound due to the friction between various moving parts of machine.

(iii) In machines, friction causes wear and tear on their moving parts.

Chapter No # 04
Turning Effect of Force

101. Define parallel forces and its types?
Lhr.2014, 15, 17, 19

Ans. *Such forces are parallel to each other is called parallel forces.*

Like parallel forces. The forces that are parallel to each other and have the same direction,

Unlike parallel forces. The forces that are parallel but have direction opposite to each other.

102. Describe addition of forces.

Ans. A resultant force is a single force that has the same effect as the combination effect of all the forces to be added.

One of the methods for the addition of forces is a graphical method called head to tail rule.

103. Define head to tail role.

Ans. Take any one of the vectors as first vector **A.** Then draw next vectors **B** such that its tail coincides with the head of the first vectors **A** and so on. It is called head to tail rule.

104. Define resultant vectors. Lhr.2013

Ans. A vector R such that its tail is at the tail of vector A, the first. While its head is at the head of vector B, the last vector. is called resultant vector.

105. What is resolution of forces? Write its components? Lhr.2017, 18

Ans. *The process of splitting up of a force into two mutually perpendicular components is called the resolution of forces.*

$$F = F_x + F_y$$

(i) Horizontal components. $F_x = F\cos\theta$

(ii) Vertical components. $F_y = F\sin\theta$

106. What are perpendicular components?
Lhr.2014

Ans. If a force is formed from two mutually perpendicular components then such components are called its perpendicular components or rectangular components.

$$F = F_x + F_y$$

(i) Horizontal components. $F_x = F\cos\theta$

(ii) Vertical components. $F_y = F\sin\theta$

107. Define rigid body.
Lhr.2013, 14, 15, 17, 18

Ans. A body is composed of large number of small particles. If the distance between all pairs of particles of the body do not change by applying a force then it is called rigid body.

108. Define axis of rotation.
Lhr.2013, 14, 15, 17

Ans. The particle of the body move in circles with their centers all lying on the line, this line is called the axis of rotation of the body. Forces that produce turning effect are very common.

109. What is torque? Lhr.2013, 17

Ans. *The turning effect of a force is called the torque or moment of force.*

The torque τ is determined by the product of force F and moment arm L.

$$\text{Torque} = \tau = F \times L$$

The SI unit of torque is Nm.

110. Define line of action and moment arm.
Lhr.2015, 16, 18

Ans. **Line of action.**

The line along which a force act is called line of action of force **F**.

Moment arm.

The perpendicular distance between the acts of rotation and the line of action of the force is called the moment arm of the force. It is denoted distance L.

111. Define principle of moments and its types?

Ans. A body is balanced if the sum of clockwise momentum acting on the body is equal to the sum of anticlockwise moments acting on it.

Clockwise moment.

A force that turns a spanner in the clockwise direction generally used to tighten a nut. The torque or moment of the so produced is called clockwise torque.

Anticlockwise moments.

To lose a nut, the force is applied such that it turns the unit in the anticlockwise direction. The torque or moment of the force so produced is called anticlockwise.

112. Define Centre of mass.
Lhr.2013, 14, 15, 16, 17

Ans. Centre of mass of the system is such a point where an applied force causes the system to move without rotation.

113. Define Centre of gravity.
Lhr.2013, 14, 15, 16, 17

Ans. A point where the whole weight of the body appears to act vertically downward is called centre of gravity of a body.

114. What is couple? Lhr.2013, 16

Ans. *A couple is formed by two unlike parallel forces of the same magnitude but not acting along the same line.*

$$\text{Couple} = F \times r$$

115. What is the example of Couple?

Ans. A cyclist pushes the pedals of a bicycle. This

forms a couple that acts on the pedals. The pedals cause the toothed wheel to turn making the rear wheel of the bicycle to rotate.

116. Write first 1st conditions of equilibrium. Lhr.2014, 15, 18

Ans. *"A body is said to be satisfy first condition of equilibrium if the resultant of all the forces acting on it is zero."* $\sum F = 0$

Sum of x-component forces is zero.

$\sum F_x = 0$

Sum of y-component forces is zero.

$\sum F_y = 0$

117. Write second 2st conditions of equilibrium. Lhr.2018

Ans. *"If the sum of all the torque acting on the body is equal to the zero then this is called second condition of equilibrium."*

$\sum \tau = 0$

118. Define Stable equilibrium. Lhr.2014, 19

Ans. A body is said to be in stable equilibrium if after a slight tilt it return to its previous position.

Consider a book lying on the table. Tilt the book slightly about its one edge by lofting from the opposite side. It returns to its previous position when sets free.

Unstable Equilibrium:

If a body does not return to its previous position when sets free after a slightest tilt is said to be in unstable equilibrium.

Take a pencil and try to keep it in the vertical position on its tip. Whenever you leave it, the pencil topples over about its tip falls down. This is called unstable equilibrium.

Neutral Equilibrium:

If a body remains in its new position when disturbed from its previous position, it is said to be in a state of neutral equilibrium.

Take a ball and place it on a horizontal surface. Roll the ball over the surface and leave it after displacing from its previous position. It remains in its new position and does not return to its previous position.

119. How head to tail rule helps to find the resultant of forces?

Ans. **Head to Tail Rule:**

Head to tail rule helps to find the resultant forces. Method is given as.

Step.1

Select a suitable scale and draw the representative lines of vector to be added.

Step.2

Join head to first vector to the tail of second.

Step.3

Draw a vector from the tail of first vector to head of second vector called resultant vector.

120. When a body is said to be in equilibrium? Lhr.2016

Ans. A body is said to be in equilibrium if no net force acts on it.

121. Why there is a need of second condition for equilibrium if a body satisfies first condition for equilibrium?

Ans. For a body to be in complete equilibrium, both conditions should be satisfied i.e. both linear acceleration and angular acceleration should be zero. In case of couple, two equal but opposite forces act. First condition of equilibrium is satisfied i.e. linear acceleration is zero, yet it may rotate. It has angular acceleration. For angular acceleration to be zero, the net torque acting on it should be zero.

122. Give an example of a moving body which is in equilibrium.

Ans. If the body is moving with uniform velocity it is said to be in dynamic equilibrium.

A paratrooper coming down with terminal velocity (constant velocity) also satisfies first condition for equilibrium and is thus in equilibrium.

123. Think of a body which is at rest but not in equilibrium. Lhr.2015, 16

Ans. In simple pendulum when the pendulum is at extreme position it is at rest for a while but at that time gravitational force remains acting on it. So the pendulum is at rest but not in equilibrium.

124. Why a body cannot be in equilibrium due to single force acting on it?

Ans. When a single force act on a body. Body in the direction of force. This force is not balanced by any other force. Hence body in not in equilibrium.

125. Why the height of vehicles is kept as low as possible? Lhr.2013

Ans. The height of a vehicle is kept as low as possible so that its center of gravity remains as low as possible. A lower center of gravity keeps the body ore stable.

The height of vehicles is kept as low as possible to convert them into streamline shape or fish shape so that less friction will act upon them.

Chapter No # 05
Gravitation

126. Who gave the idea of Gravity?

Ans. The first man who came up with the idea of gravity was Isaac Newton. It was an evening of 1665 when he was trying to solve the mystery why planets revolve around the Sun. Suddenly an apple fell from the tree under which he was sitting. The idea of gravity flashed in his mind. He discovered not only the cause of falling apple but also the cause that makes the planets to revolve around the Sun and the moon around the Earth.

127. State force of gravitation. Lhr.2013, 14, 15, 16, 17, 18

Ans. *Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.*

$$F = G\frac{m_1 m_2}{d^2}$$

The value of gravitation is $10Nkg^{-1}$.

128. What is gravitational field?

Ans. according to Newton's law of gravitation, the gravitational force between a body of mass m and the earth is given by

$$F = G\frac{m\,Me}{r^2}$$

129. What is a field force? Lhr.2016, 18, 19

Ans. The gravitation pulls of earth acting on a body whether the body is in contact with earth or not is called field force.

130. What is meant by gravitation field strength? Lhr.2013, 14, 15, 18

Ans. "In gravitation field of the earth, the gravitation force per unit mass is called gravitation field strength of the earth." Near the surface of the earth, the gravitation field strength is $10Nkg^{-1}$.

131. Define Satellite and give example.

Ans. *Satellites are such objects that revolve around a planet. i.e. earth revolve around the sun.*

132. What is artificial satellite? Lhr.2013

Ans. Scientists have sent many objects into the space. Some of these objects revolve around the earth. These are called artificial satellite.

133. Write uses of artificial satellite.

Ans. Artificial satellites are used for

(i) Worldwide communication.
(ii) Navigation purpose.
(iii) Weather observation.
(iv) Military Purposes.

134. Define geo-stationary satellite? Lhr.2017

Ans. A geostationary satellite is an earth-orbiting satellite, placed at an altitude of approx. 35800 km directly over the equator that revolves in the same direction the earth rotates.

135. What is the height of geo-stationary satellite?

Ans. The height of a geostationary satellite is about 42,300 km from the surface of the Earth. Its velocity with respect to Earth is zero.

136. What is communication satellite?

Ans. Communication satellites take 24 hours to complete their one revolution around the Earth. As Earth also completes its one rotation about its axis in 24 hours, hence, these communication satellites appear to be stationary with respect to Earth.

137. What is orbital velocity?

Ans. The critical velocity of a satellite in order to keep on moving around the earth at a specific height is called orbital velocity.

$$V_o = \sqrt{g(R+h)}$$

138. What is orbital speed of a low orbit satellite? Lhr.2016

Ans. A satellite revolving around very close to the earth is known as low orbit satellite.

$$V_o = \sqrt{R\,g}$$

$g = 10\ ms^{-1}$, $R = 6400km$, $V_o = 8\ kms^{-1}$

139. Why earlier scientists could not guess about the gravitational force?

Ans. Due to very small value of gravitational constant G, the gravitational force around us is very small and we do not feel it. This was the reason that the earlier scientists could not guess about the gravitational force.

140. How can you say that gravitational force is a field force?

Ans. When a body attracts other body, whether it is in contact with other or not, then this attracting force is called a filed force".

Gravitational force is a non-contact force. The gravitational pull of the Earth acting on the body whether the body is in contact with the Earth or not. So, gravitational force is a field force.

141. Why is law of gravitation important to us?

Ans. Law of gravitation is important to us because the motion of objects in space, motion of planets around the sun. It helps us to find the gravitational force of other planets in the universe. It is used to understand variation in the value of gravitational acceleration 'g' with altitude. It is used to find the weight of the bodies in the universe.

142. Can you determine the mass of our moon? If yes, then what you need to know?

Ans. yes, the mass of our moon 'M_m' is determine by the following formula.

$$F = \frac{g_m R_m^2}{G}$$

So, g_m is the gravitational acceleration on the surface of moon. G is the gravitational constant. R_m is the radius of the moon.

143. Why does the value of G vary from place to place? Lhr.2016

Ans. As we know that

$$g_h = \frac{GM}{(R+H)^2}$$

The value of 'g' is inversely proportional to the square of the radius of the earth. It does not remain constant. It decreases with altitude.

According to this equation value of "g" depends upon the height. That is why value of "g" varies place to place.

144. Explain how the value of g varies with altitude.

Ans. By the equations

$$g_h = \frac{GM}{(R+H)^2}$$

We can see that the value of "g" is inversely proportional to the height so as we go higher, the value of "g" becomes less and as we move towards earth its value increases.

145. How Newton's law of gravitation helps in understanding the motion of satellites?

Ans. The satellites are moving around the Earth with centripetal acceleration. This acceleration is caused by the gravitational force between the satellite and the Earth according to Newton's second law of motion.

146. On what factors the orbital speed of a satellite depends? Lhr.2016

Ans. The orbital speed of a satellite depends upon the height of the satellite from the surface of the earth and value of g at that height.

$$V_o = \sqrt{g\,r}$$

The greater is radius of orbit, the smaller is orbital speed of satellite.

147. Why communication satellites stationed at geostationary orbits? Lhr.2014

Ans. Since Earth completes its rotation in 24 hours and communication satellites also take 24 hours to complete its one round. So communication satellites are stationary with respect to Earth. So they are called geostationary satellites.

148. What is GPS? Or what are navigation systems? Lhr.2014

Ans. Global positioning system (GPS) is satellite system. It helps us to find the exact position of an object anywhere on the land, on the sea or in the air. GPS consists of 24 earth satellites. These satellites revolve around the earth twice a day with a speed of 3.87 kms^{-1}.

149. Why can we not feel gravitational force between the bodies around us? Lhr.2017, 18

Ans. As from formula of law of gravitational force,

$$F = \frac{Gm_1m_2}{d^2}$$

Where G is the proportionality constant and value of G is 6.673×10^{-11} Nm^{-1} Kg^{-2}.

Due to small value of G, the gravitational force of attraction between objects around us is very small and we don't fell it.

150. What is the distance of the moon from the earth?

Ans. Moon is nearly 3, 80,000 km away from the Earth. It completes its one revolution around the Earth in 27.3 days

Chapter No # 06
Work and Energy

151. Define work.
Lhr.2013, 14, 15, 17, 18

Ans. *"Work is done when force acting on a body displaces it in the direction of force."*

Work is a product of force F and displacement S in the direction of force.

Work done = Force × Displacement

$W = F.S$

The SI unit of work is joule (J).

152. Define unit of work, joule.
Lhr.2013, 14, 15, 17, 18

Ans. The SI unit of work is joule (J).

" The amount of work is one joule when a force of one Newton displaces a body through one meter in the direction of force"

$1J = 1N \times 1m$

153. Define kinetic energy and write its equation. Lhr.2014, 15, 19

Ans. *The energy possessed by a body due to its motion is called kinetic energy.*

$K.E = \frac{1}{2} mv^2$

154. Define potential energy and write its equation. **Lhr.2013, 19**

Ans. *The energy possessed by a body due to its position is called potential energy.*

$P.E. = w.h = mgh$

155. Define heat energy.

Ans. Heat is a form of energy given out by hot bodies. Large amount of heat by burning fuel. Heat is also produces when motion is opposed by frictional force. Sun is the main source of heat energy.

156. Define mechanical energy with example.
Lhr.2014, 15, 16, 17

Ans. The energy possessed by a body both due to its motion or position. i.e. moving car, lifted hammer.

157. Define sound energy. Lhr.2014, 15

Ans. Sound is a form of energy. It is produced when a body vibrates, such as vibrating diaphragm of a drum, vibrating string of a sitar.

158. Define nuclear energy. Lhr.2018

Ans. Nuclear energy is the energy released on the form of nuclear radiations in addition to heat and light nuclear reaction. Fission and fusion reaction heat energy released in nuclear reactors.

159. Write the uses of wind energy. Lhr.2014

Ans. Wind energy has been used as a source of energy for centuries. It has powered sailing ships across the oceans. It has been used by windmills to grind grains and pump water. Wind power is used to turn wind turbines.

160. How does heating affect the motion of molecule of a gas? Lhr.2015, 18

Ans. When a gas is heated, the velocity of a gas molecules increases due to which kinetic energy and temperature of a gas increases.

When a body is heated, the kinetic energy of its molecules increases, the average distances between the molecules increase. Thus, the motion of molecules of gas increases of heating.

161. What is Einstein mass energy equation?
Lhr.2013, 14, 15

Ans. A loss in the mass of a body provides a lot of energy. This happen in nuclear reactions.

The relation between mass and energy is given by Einstein's mass-energy equation.

$E = m c^2$

Here c is the speed of light (3×10^8 ms^{-1}).

162. Define efficiency and its formula.
Lhr.2014, 18

Ans. Efficiency of a system is the ratio of required form of energy obtained from a system is output to the total energy given to the input.

$$\text{Efficiency} = \frac{\text{required form of output}}{\text{total input energy}}$$

$$\text{Efficiency} = \frac{\text{required form of output}}{\text{total input energy}} \times 100$$

163. What is power?
Lhr.2014, 15, 16, 17, 18, 19

Ans. *Power is defined as the rate of doing work.*

$$\text{Power} = \frac{\text{work done}}{\text{time taken}} = \frac{w}{t}$$

SI unit of power is watt (W). It is a scalar quantity.

164. Define the unit of power.
Lhr.2014, 15, 16, 17, 18

Ans. SI unit of power is watt (W).

The power of a body is one watt if it does work at the rate of 1 joule per seconds (1 Js^{-1}).

165. When does a force do work?

Ans. "Work is done when force acting on a body displaces it in the direction of force." It is our common observation that sometimes force and displacement are in the same and opposite direction.

166. Why do we need energy?

Ans. We always need energy to do any type of work. The energy is an important and fundamental need of our daily life.

167. Define energy; give two types of mechanical energy.

Ans. *A body possesses energy if it is capable to do*

work." Energy is a scalar quantity.

Mechanical energy is two types.

(i) Kinetic energy (K.E)

(ii) Potential energy (P.E).

168. Why fossils fuels are called non-renewable form of energy? Lhr.2013

Ans. They are usually hydrocarbon. When they are burnt, they combine with oxygen from the air. Then energy is released as heat. Fossil fuels took millions of years for their formation and they cannot be generate renew sources in the short time. They are called non-renewable resources.

169. Which form of energy is most preferred and why?

Ans. Solar energy is more preferable because it can directly obtain from sun and it does not have any type of pollution in it. It is also renewable sources of energy.

170. How is energy converted from one form to another? Explain

Ans. Energy cannot be destroyed but it can be converted from one form to another form and the total amount of energy remains constant at any time.

For example heat energy is converted into mechanical energy and electrical energy can be converted into mechanical energy and electrical energy can be converted into light and heat energy.

171. Define biomass?

Ans. Biomass is fuel that is developed from organic material, a renewable and sustainable source of energy used to create electricity or other forms of power.

172. Write two disadvantages of fossil fuels. Lhr.2017, 18

Ans. **(1)** Fossil fuels are non-renewable energy resources. Their supply is limited and they will eventually run out…

(2) Fossil fuels are release carbon dioxide when they burn, which adds to the greenhouse effect and increases global warming.

(3) Fossil fuels release harmful waste products which pollute the environments.

173. Describe Solar House Heating.

Ans. its use in houses and offices as well as for commercial industrial purposes is quite recent. Complete solar house heating systems are successfully used in areas with a minimum amount of sunshine in winter.

A heating system consists of

(i) A collector

(ii) A storage device

(iii) A distribution system

174. Describe the pole vaulter.

Ans. A pole vaulter uses a flexible vaulting pole made of special material. It is capable to store all the vaulter's kinetic energy while bending in the form of potential energy. The vaulter runs as fast as possible to gain speed. The kinetic energy gained by the pole vaulter due to speed helps him/her to rise up as the vaulter straightens. Thus he attains height as the pole returns the potential energy stored by the vaulter in the pole.

175. Why geothermal wells are made?

Ans. Geothermal well can be built by drilling deep near hot rocks at places, where magma is not very deep. Water is then pushed down into the well. The rocks quickly heat the water and change it into steam. It expands and moves up to the surface. The steam can be piped directly into houses and offices for heating purposes or it can be used to generate electricity.

Chapter No # 07
Properties of Matters

176. State the characteristics of kinetic molecular model of matter. Lhr.2013, 14, 16

Ans. The kinetic molecular model of matter has some important characteristics. These are:

(i) Matter is made up of particles called molecules.

(ii) The molecules remain in continuous motion.

(iii) Molecules attract each other.

Kinetic molecular model is used to explain the three states of matter – solid, liquid and gas.

177. Define plasma.

Ans. "Ionic state of matter is called plasma."

The collision between the atoms and molecules of the gas become as strong that they tear off the atoms. Atoms lose their electrons and become positive electrons. This ionic state of matter is called **plasma**. Plasma is also formed in gas discharge tube when electric current passes through these tubes.

178. Define density and its units. Lhr.2013, 17, 19

Ans. *Density of a substance is defined as its mass per unit volume.*

$$\text{Density} = D = \frac{\text{mass}}{\text{volume}} = \frac{m}{v}$$

the unit of density is kgm^{-3}.

179. What is pressure and Atmospheric pressure? Lhr.2015, 16, 18

Ans. *The force acting normally per unit area on the surface of a body is called pressure.*

$$\text{Pressure} = P = \frac{\text{Force}}{\text{Area}} = \frac{F}{A}$$

the units of pressure is Nm^{-2} or 1 Pa.

Atmospheric pressure:

The earth is surrounded by a cover of air is called atmosphere. It extends to few hundred kilometers above sea level. Atmosphere is a mixture of gases. It is called atmospheric pressure.

180. Define Pascal law. Lhr.2015, 17, 19

Ans. Pressure applied at any point of a liquid enclosed in a container, is transmitted without loss to all other parts of the liquid.

$$F_2 = F_1 \frac{A}{a}$$

181. States Archimedes principle. Lhr.2016, 18, 19

Ans. When an object is totally or partially immersed in a liquid, an up thrust acts on it equal to the weight of the liquid it displaces.

$$\text{Up thrust of liquid} = \rho \text{ g V}$$

182. What are upthrust and principle of floatation?

Ans. *A floating object displaces a fluid having weight equal to the weight of the object.*

The upthrust is always equal to the weight of the fluid displaced by the object.

183. Define ships and Submarine.

Ans. A wooden block floats on water. It is because the weight of an equal volume is greater than the weight of the block. Ships and boats are designed on the same principle of floatation.

Submarine:

A submarine can travel over as well as under water. It also works on the principle of floatation. It floats over water when the weight of water equal to its volume is greater than its weight.

184. Define elasticity. Lhr.2016, 17, 18, 19fi

Ans. The property of a body to restore its original size and shape as the deforming force ceases to act is called elasticity. There are two types of elasticity is stress and strain.

185. Define stress and strain. Lhr.2016, 18

Ans. *The force acting on unit area at the surface of a body is called stress.*

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \frac{F}{A}$$

the units of stress is Nm^{-2}.

Strain:

The ratio of change in size to the original size is called strain.

$$\text{strain} = \frac{\Delta L}{L}$$

186. State Hook's law. Lhr.2013, 17, 19

Ans. The strain produced in a body by the stress applied to it is directly proportional to the stress within the elastic limit of the body.

$$\text{stress} \propto \text{strain}$$
$$\text{stress} \propto \text{constant} \times \text{strain}$$
$$\frac{\text{stress}}{\text{strain}} = \text{constant}$$

187. State Young's Modulus. Lhr.2013, 17, 19

Ans. *'The ratio of stress to the tensile strain is called young modulus''.*

$$Y = \frac{\text{stress}}{\text{Tensie strain}} = \frac{F\,Lo}{A\,\Delta L}$$

SI unit of young's modulus is Nm^{-2}.

188. Can we use hydrometer to measure the density of milk?

Ans. Yes, we can use hydrometer to measure the density of milk. But for this purpose, a special kind of hydrometer known as locometer is used.

189. Show that atmosphere exerts pressure.

Ans. In atmosphere of the Earth, there are gases,

water vapours and dust particles. All of these consist of material particles. Due to the force of gravity acting on these particles the object inside the atmosphere experience pressure in all around equally.

190. It is easy to remove air from a balloon but it is very difficult to move air from a glass bottle. Why?

Ans. The air inside balloon is compressed air. Pressure inside the balloon is greater than the atmospheric pressure. So it is easy to remove air from a balloon. But air inside a glass bottle is already at atmospheric pressure. So it is very difficult to remove air from a glass bottle.

191. What is a barometer and hydrometer?

Ans. It is the instruments which are used to measure the atmospheric pressure.

Hydrometer:

Hydrometer is a glass tube with a scale marked on its stem and heavy weight in the bottom.

Hydrometer is used to measure the concentration of acid in a battery called acid meter.

192. Why water is not suitable to be use in barometer? Lhr.2014

Ans. Since the density of water is much less than mercury so we cannot use water in barometer. A glass tube more than 10m is required to make a water barometer. If we use water in barometer a long glass tube is required.

193. What makes a sucker pressed on a smooth wall sticks to it?

Ans. A sucker is disk shaped. When pressed against a smooth surface, the air is forced from beneath the sucker. The rubber makes an air tight seal and the air pressure outside is greater than the air pressure beneath the sucker, thus forcing the sucker to stick it on a smooth wall.

194. Why does the atmosphere pressure vary with height?

Ans. With the increase of height quantity of air began to decrease due to which atmospheric pressure also become low. Atmospheric pressure decreases due to decrease in density of air. That’s why the atmosphere pressure varies with height.

195. What does it mean when the atmospheric pressure at a place fall suddenly?

Ans. When the atmospheric pressure fall suddenly at a place it may be storm or rain at that place to occur in few hours’ time.

196. What changes are expected in weather if the barometer reading shows a sudden increase?

Ans. Sudden increase in the barometer reading means that there is rapid increase in atmospheric pressure. It means that it will soon followed by a decrease in the atmospheric pressure indicating poor condition ahead.

197. Explain how a submarine moves up the water surface and down into water.

Ans. When a submarine is not filled with sea water, its weight is less than upthrust acting on it. So it floats on the surface of sea water. But when it filled with water, then its weight is greater than the upthrust acting on it. So it sinks into water.

198. Why does a piece of stone sink in water but a ship with a huge weight floats?

Lhr.2014, 15

Ans. A piece of stone sink in water because up thrust force acts on it is less than its weight but on ship up thrust force is greater than its weight due to which it floats on water.

199. How mechanical energy changes into heat energy? Lhr.2014

Ans. During the rubbing of our hands we use muscular energy as a result heat is produced. In this process mechanical energy is converted into heat energy.

200. What is Deforming force?

Ans. If the stress is increased beyond the elastic limit of a body, the body permanently changes and does not recover to its original shape. This force is called deforming force.

Chapter No # 08
Thermal Properties of Matter

201. Define heat. Also write its uses. Lhr.2013, 14, 16, 19

Ans. *Heat is the energy that is transferred from one body to the other body in thermal contact with each other as a result of the difference of temperature between.*

- **(i)** It is necessary for our survival.
- **(ii)** We need it to cook our food
- **(iii)** Heat is need in industrial process.

202. Define temperature. Lhr.2013, 14, 16, 19

Ans. *Temperature of a body is the degree of hotness or coldness of a body.*

SI unit of temperature is Kelvin (K).

203. Describe internal energy of a body.

Ans. The total sum of kinetic energy and potential energy associated with the atoms, molecules and particles of a body is called its internal energy.

204. Define thermometer. Lhr.2013

Ans. A device which is used to measure the temperature of a body is called thermometer. Example some substances expand on heating. Change their colours change their electric resistances.

205. Write scales of temperature. Lhr.2013, 17

Ans. There are three scales of temperature:

- **(i)** Celsius scales or Centigrade scales
- **(ii)** Fahrenheit scales
- **(iii)** Kelvin scales

206. Write different scale of temperature.

Ans. Scale of Temperature

(i) from Celsius to Kelvin scale

$$T\ (K) = 273 + C$$

(ii) From Kelvin to Celsius scale

$$C = T\ (K) - 273$$

(iii) From Celsius to Fahrenheit scale

$$F = 1.8C + 32$$

207. What is meant by freezing and melting point? Lhr.2017

Ans. The temperature at which substance changes from liquid to solids is called freezing point.

Melting point is that point at which a solid starts melting.

208. What is Heat Capacity? Lhr.2014, 15

Ans. Heat capacity of a body is the quantity of thermal energy absorbed by it for one Kelvin (1K) increase in its temperature.

$$\text{Heat capacity} = \frac{\Delta Q}{\Delta T} = \frac{mc\,\Delta T}{\Delta T} = mc$$

209. Define specific heat capacity. Lhr.2017, 18

Ans. Specific heat capacity of a substance is the amount of heat required to raise the temperature of 1Kg mass of that substance through 1K.

$$c = \frac{\Delta Q}{m\Delta T}$$

SI units of specific heat is J kg^{-1} K^{-1}.

210. What is meant by latent heat of fusion? Lhr.2016, 18, 19

Ans. Heat energy is required to change unit mass of a substance from solid to liquid state at its melting point without changes in its temperature is called latent eat of fusion.

$$\Delta Q_f = m H_f$$

211. What is meant by latent heat of vaporization?

Ans. The quantity of heat that changes unit mass of a liquid completely into gas at its boiling point without any change in its temperature is called its latent heat of vaporization.

$$\Delta Q_v = m H_v$$

212. Define evaporation.

Ans. Evaporation is the changing of a liquid into vapors (gaseous state) from the surface of the liquid without heating it.

213. What is the effect of temperature on evaporation? Lhr.2013, 15

Ans. At higher temperature, more molecules of a liquid are moving with high velocities. Thus, more molecules escape from its surface. Evaporation is faster at high temperature than at low temperature.

214. What is meant by thermal expansion?

Ans. Most of the substances solids, liquid and gases expand on heating and contact on cooling. Their thermal expansions and contractions are usually small and are not noticeable. However, these expansions and contractions are important in our daily life.

215. What is meant by thermal equilibrium? Lhr.2014, 15

Ans. Temperature determined the direction of flow of heat. Heat flows from a hot body to cold body until thermal equilibrium is reached.

216. Define the coefficient of linear expansion. Lhr.2014

Ans. *The expansion of substance along their length is called linear expansion.*

$$L = L\ (1 + \alpha\Delta T)$$

The fractional increase in its length per Kelvin rise in temperature is called coefficient of linear expansion.

$$\alpha = \frac{\Delta L}{L_{\circ}\,\Delta T}$$

217. What is meant by Bimetal Strip?
Lhr.2015

Ans. A bimetal strip consists of two thin strips of different metals such as brass and iron joined together.

On heating the strip, brass expands more than iron. This unequal expansion causes bending of the strip.

218. Write uses of Bimetal Strip.
Lhr.2015

Ans. Bimetal strip are used for various purpose.

(i) Bimetal thermometers are used to measure temperature in furnace and ovens.

(ii) Bimetal strip are used in thermostats.

(iii) Bimetal thermostat switch is used to control the temperature of heater coil in electric iron.

219. Why does heat flow from hot body to cold body?

Ans. Temperature determines the direction of flow of heat. Heat flows from higher temperature to lower temperature. As the temperature of hot body is more than the cold body, therefore heat flows from hot body to cold body. The flow of heat will continue till the bodies attain thermal equilibrium.

220. How does heating affect the motion of molecules of a gas?

Ans. When a gas is heated, the kinetic energy of gas molecules goes on increasing. This causes the gas molecules to move with higher velocities. During their random motion they collide with each other and also with the walls of the container. Thus, they put pressure on the walls of the container.

221. What is thermometer? Why mercury is preferred as thermometric substance?

Ans. A device that is used to measure the temperature of a body is called thermometer.

It is highly boiling point, less specific heat, low freezing point.

Mercury is preferred as a thermometric substance because it has all the thermometric properties. Mercury freezes at -39 C and boils 375 C. Thus mercury is one of the most suitable thermometric materials.

222. What is meant by evaporation? Explain how cooling is produced by evaporation.

Ans. Evaporation is the changing of a liquid into vapors (gaseous state) from the surface of the liquid without heating it.

Evaporation takes place at all temperatures but only from the surface of a liquid when fast moving molecules escape out from the surface of the liquid. Molecules that have lower kinetic energies are left behind. This lowers the average kinetic energy of the liquid molecules and the temperature of the liquid. Since temperature of a substance depends on the average kinetic energy of its molecules.Hence cooling is produce due to evaporation.

223. On what factors the evaporation of a liquid depends?

Ans. The rate of evaporation factors depends.

i. Temperature
ii. Surface area
iii. Wind
iv. Nature of the liquid

224. Why gaps are left in railway tracks?
Lhr.2013, 17

Ans. Gaps are left in railway tracks to compensate thermal expansion during hot season.

225. Why we use gap in rollers in bridge?

Ans. Bridges with rollers below one of their ends allow movements due to expansion and contraction. Bridges made of steel girders also expand during the day and contract during night. They will bend if their ends are fixed. To allow thermal expansion, one end is fixed while the other end of the girder rests on rollers in the gap left for expansion. Overhead transmission lines are also given a certain amount of sag so that they can contract in winter without snapping.

Chapter No # 09
Transfer of Heat

226. Describe transfer of heat.

Ans. When two bodies at different temperature are in thermal contact with each other. Thermal energy from a hot body flows to a cold body in the form of heat. This is called as transfer of heat.
There are three ways by which transfer of heat takes place. These are:

i. Conduction
ii. Convection
iii. Radiation

227. Describe conduction. Lhr.2014, 19

Ans. The mode of transfer of heat by vibrating atoms and free electrons in solids from hot to cold parts of a body is called conduction.
In solid, heat is transferred from one part to other parts from atoms to atoms or molecule to molecules due to collisions.

228. Describe thermal conductivity. Lhr.2014, 19

Ans. The rate of flow of heat across the opposite faces of a meter cube of a substance maintained at a temperature difference of one Kelvin is called thermal conductivity.

229. What is the effect of length of the solid on thermal conductivity? Lhr.2015

Ans. Larger is the effect of length between the hot and cold ends of the solid, more time it will take to conduct heat to the colder end and smaller will be the rate of flow of heat. Thus

$$\text{Rate of flow of heat } \frac{Q}{t} \propto \frac{1}{L}$$

230. Write the uses of conductors and Non-conductor's. Lhr.2019

Ans. Good conductors are used when quick transfer of heat is required through a body. Thus cookers, cooking plate, boiler, radiators and condensers of refrigerators, etc. are made of metals such as aluminum or copper. Similarly, metal boxes are used for making ice, ice cream, etc.

Uses of Non-conductor's:

Insulators or bad conductors are used in home utensils such as handles of sauce-pans, hot plates, spoons, etc. They are made up of wood or plastic. Air is one of the bad conductors or best insulator.

231. What is meant by convection? Lhr.2016, 17, 19

Ans. *The transfer of heat by actual movement of molecules from hot place to a cold place is known*

232. What is meant by convection currents? Lhr.2013, 18

Ans. Gases also expand on heating, thus convection currents are easily set up due to the difference in the densities of air at various parts in the atmosphere.

233. Difference between land breeze and sea breeze. Lhr.2014, 18, 19

Ans. The breeze which blows from land to sea during night time is called **land breeze.**
The breeze which blows from sea to land during day time is called **sea breeze.**

234. What cause a glider to remain in air? Lhr.2013, 17

Ans. A glider is a small aero plane without engine. Glider pilot uses upward movement of hot air current due to convection of heat. These rising of hot air are called thermals. Glider rides over these thermals.
The upward movement of air current in thermals helps them to stay in the air for long time.

235. What is radiation and on what factors radiation depends? Lhr.2018, 19

Ans. Radiation is the mode of transfer of heat from one place to another in the form of waves called electromagnetic waves.

Factors radiation depends.

Radiation depends upon various factors such as given below

(i) Colour and texture of the surface
(ii) Surface temperature
(iii) Surface area

236. Define greenhouse effect. Lhr.2015, 17

Ans. As the concentration CO_2 in air increases, less heat energy is lost from the surface of the earth. The average temperature of the surface gradually increases. This is called greenhouse effect.

OR

The **greenhouse effect** is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by **greenhouse** gases. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, ozone.

237. What is global warming?

Ans. During the recent years, the percentage of carbon dioxide has been increased considerably. This has caused an increase in the average temperature of the earth by trapping more heat due to greenhouse effect.

238. Why metals are good conductor of heat?

Ans. Metals are good conductors of heat because they contain free electrons which transfer heat, from one end to another end.

239. Why a metal feels colder to touch than wood kept in a cold place?

Ans. Good heat absorber is also good heat emitters and bad heat absorber are also bad heat emitters. As metals are good heat absorber as compared to wood, thus, a metal emits heat at faster rate than the wood which is a bad heat emitter.

240. Why land breeze blows from land towards sea?

Ans. At night, the land cools faster than the sea. Therefore air above the sea is warmer, rises up and cold air from the land begins to move towards the sea. It is called land breeze.

241. Why doubled glass vessel is used in thermos flask?

Ans. A thermos flask consists of a double walled glass vessel. It reduces the transfer of heat by conduction, convection and radiation.

242. Why deserts soon get hot during the day and soon get cold after sunset?

Ans. Deserts are good heat absorber due to high thermal conductivity of sand .Since good heat absorbers are good heat emitters. Thus, deserts soon get hot during the day and soon get cold after sunset.

243. Why conduction of heat does not take place in gases?

Ans. Conduction is the mode of transfer of heat by vibrating atoms and free electrons in solids from hot to cold parts of a body. In gases atoms are far apart. Thus, there is a very small chance of collisions between their atoms. Gases do not have free electrons. That is why conduction of heat does not take place in gases.

244. What measure do you suggest to conserve energy in houses? Lhr.2016

Ans. Following measure suggest conserving energy in house.

i. Hot water tanks are insulated by plastic or foam lagging.
ii. Wall cavities are filled with plastic foam or wool.
iii. Ceiling of rooms is covered by insulating materials (False Ceiling)
iv. Double glazed window panes are used.

245. Why transfer of heat in fluids takes place by convection?

Ans. Since the distance between liquids molecule is greater as compared to solids so transfer of heat cannot be done by conduction process. So in liquids heat is flow due to convection process only.

246. How does heat reaches us from the sun?

Ans. One sun is a major source of energy. Since there is a space between the earth and sun, so the mode of transfer of heat from one place to another is called radiation.

247. We wear white and light coloured clothes in summer. Why? Lhr.2017

Ans. We wear white and light coloured clothes in summer because white and light colours are bad absorbed and good reflector of heat. That's heat is not absorbed by white or light coloured clothes.

248. Why is it not advisable to wear dark colours in summer? Lhr.2014

Ans. Because they have the tendency to absorb more amount of radiation which causes hotness, so it is not advisable to wear dark colours in summers.

249. What are the four faces of Leslie's cube?

Ans. A Leslie cube is a metal box having faces of different nature. The four faces of Leslie's cube may be as follows

(i) A shining silvered surface
(ii) A dull black surface
(iii) A white surface
(iv) A coloured surface

Due to difference in nature of faces, the emittance, absorption and reflection of heat is of different amount from sides of Leslie cube.

250. Why sauce pans are made of metals?

Ans. Sauce pans are made of metal for quick heat transfer. Because metals are good conductor of heat and contain free electrons. These free electrons transfer heat to other parts of solid quickly.

Most Important (100) Definitions

2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 21, 27, 32, 40, 44, 47, 49, 50, 51, 53, 54, 56, 58, 59, 72, 73, 74, 75, 77, 78, 82, 90, 93, 94, 101, 105, 107, 108, 109, 110, 112, 113, 114, 116, 118, 123, 127, 129, 130, 138, 143, 148, 149, 151, 152, 153, 154, 156, 157, 158, 159, 160, 161, 162, 163, 164, 172, 176, 178, 179, 180, 181, 184, 185, 186, 187, 198, 201, 202, 205, 208, 209, 210, 213, 215, 218, 224, 227, 228, 231, 232, 233, 234, 235, 236, 244, 247